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THE IMPACT OF URBANIZATION ON COLUMBIA LAKE

Columbia, Connecticut

by

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FOREWORD

The study of Columbia Lake which is reported here is the first in a series of reports on a variety of the factors which relate to the impact of urbanization on New England lakes. Such matters as land use, regulatory agencies, eutrophication, water quality, and limnology are involved in the way lakes are affected by the presence of man over an extended period of time. Hopefully, the future use of these lakes may be made agreeable to man's needs by some of the studies now being conducted.

The research into the impact of urbanization on New England lakes was originally initiated in 1972 by a proposal written by Dr. F.C. Sargent of Vermont that the New England Council of Water Center Directors might investigate this topic on a regional basis. Because of the wide range of topics and the distances between lakes, it has taken a considerable amount of time to reach agreement on the exact nature and scope of research to be undertaken. At the present time, work is moving steadily ahead in many areas; namely, public administration, land use, economics, limnology, aquatic biology, and sedimentary characteristics. The studies are to be carried out initially for six lakes, one in each of the New England states. It is hoped that this initial investigation may lead to a more effective research effort in the states as well as in the region since the thousands of lakes and ponds in New England constitute a major resource that should be preserved for the enjoyment of future generations.

The Institute of Water Resources is most pleased to sponsor this first report and looks forward to many more in the future.

June 27, 1975

Victor E. Scottron
Director
Institute of Water Resources

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I. Introduction

Columbia Lake, Columbia, Connecticut, was chosen as the pilot study of a larger, regional investigation of the impact of urbanization on New England lakes. The following factors influenced our choice: (1) previous studies have revealed that Columbia is a reasonably typical lake in southern New England (e.g., size, depth, type of stratification, origins, problems, etc.); (2) since the lake, its watershed, and its inlet streams are entirely within the political boundaries of the town, the study of social decision-making is not complicated by competing social and political jurisdictions; (3) in recent years, the town has demonstrated an awareness of potential eutrophication, a willingness to support scientific research and to give serious consideration to the interpretation of the results; (4) its proximity to the University of Connecticut facilitates the performance of limnological and social research.

The methods employed included informal interviews with citizens and officials at state, regional, and local levels, and a search of documentary records. In addition, the opportunity of being daily, on-site observers for a period of approximately a month made it possible to develop the kind of personal relationships without which this approach could not have succeeded. This report does not attempt to incorporate the more technical aspects of the limnological research now being conducted; it focuses, instead, on the interplay of social variables which, in the long-run, determine how, and indeed, if, scientific data will be used.

II. History

A. Overview

The land area comprising the Town of Columbia was originally "owned" by two Indians, each of whom claimed it as his own. Thus, the land was purchased twice -- once in 1699 and again in 1700 by William Clark and Deacon Josiah Dewey, acting in partnership (The Story of Columbia). With the exception of a small triangle of land set aside for the Town of Andover in 1748, the original boundaries of the purchase are the Town of Columbia's boundaries today.

In the early 18th century, however, what was to become Columbia was then a part of the Town of Lebanon, known as Lebanon North Parish or Lebanon Crank. Because of the difficulties associated with travelling between the Crank and the church in Lebanon proper, the residents of the Crank obtained legal permission to separate and to form a new parish in 1715. Nearly a century later, August 21, 1804, the residents of the Crank founded the Town of Columbia. Then, as now, the Town was bounded on the north by the Hop River, on the east by Lebanon and Windham, on the south by Lebanon, and on the west by Hebron and Andover.

The Congregational Church has played an important role in Town history. One of New England's most famous ministers, the Reverend Eleazer Wheelock, preached in Lebanon Crank for 35 years in the 18th century. He established the first Indian school in the United States (More's Indian School), a structure which is still maintained near the town hall by the historical society. Wheelock later left the Crank to establish Dartmouth College.

The form of government (elected selectmen and town meetings) has existed since the Town was established in 1804. The citizens are proud of Columbia, and play an active, and often vocal, role in public affairs. The attachment of the people to the Town's land is apparent from the fact that Route 87, a state highway which crosses the town green, does not rest on state-owned land; nor does the state retain a right-of-way on either side of the road in the center of town. Aside from the surface of the road, the Town retains ownership, an unusual situation -- particularly today -- in the State of Connecticut (Town Record Book, No. 4, 1931, p.5). A healthy political rivalry has been maintained by Democrats and Republicans, but it does not appear that partisan politics necessarily indicate policy differences.

Although agriculture has been, and still is, an important part of Columbia's economic life, in the 19th century Columbia had a number of industries largely dependent upon water power: paper, lumber and grist mills, a hat factory, and a furniture factory. In addition, baseball bats were manufactured on a lathe powered by a steam engine. These enterprises were all located on various streams within the Town. By the 20th century, however, only a cotton mill on the Hop River remained. In large part, the decline of industry can be traced to the growth of urban centers. Today, the remaining important commercial enterprises are located outside of the Columbia Lake watershed, and are, therefore, not considered in this report.

B. The Lake Area

Columbia Lake was created in the mid-19th century when the American Linen Company of Willimantic, now the American Thread Company, required more water to meet increased power demands. The company purchased meadowland in Columbia, and in 1865 built a dam across the stream which is now the lake's outlet. The artificial reservoir was used as an industrial source of power until 1933 when the Town purchased it for a recreational lake.

Private cottages were built along the lake's shore; the Center Church of Hartford established a camp there in 1910; and today the shore area is so privately developed that there is not an open zoned lot for another cottage to be built. Narrow rights-of-way "snake" down to the lake allowing back-lot residents access to the water. A small public beach and dock area are open to Town residents only.

In 1935 lakefront property owners formed the Columbia Lake Association to preserve and enhance property values. The Association initiated the first request (1941) for zoning of lake front property, and was instrumental in having the lake stocked by the State Fish and Game Commission. The Association is still active and maintains a very particularistic interest in the lake.

The Town, as "owner" of the lake, spends less than 1% of its annual budget on the upkeep of the lake and dam area. The Recreation Council, a public organization, is responsible for the care and maintenance of the beach and dock area. In 1967 a concrete wall was built at the high-water line of the beach, and the beach was extended to about 4% of the 7 mile shoreline. The largest budgetary expenditure on the lake area, however, is the annual

appropriation for partial repair of the dam. Since the 1938 hurricane, when the lake overflowed and the citizens saved the dam through sandbagging, the dam has been in "sad shape". In addition to encouraging use, the Town also restricts use. One example of this is the 1960 boating ordinances limiting horsepower and licensing.

C. Previous Studies

The lake and town have a joint history, but research on the lake itself has a history of its own. In 1963, a Lake Study Committee was formed by part of the membership of the Columbia Lake Association (CLA) to contract with Continental Testing Labs of Hartford to test water quality annually. With Town approval the University of Connecticut uses the lake for limnological studies. The University's College of Agriculture prepared a fishery study on the lake in 1971, "Selected Characteristics of Certain Fishes in Columbia Lake, Connecticut with Recommendations for Improvement of Sport Fishery". The most extensive investigation, however, was "A Limnological Study of Columbia Lake, Connecticut" by Ernest Alden Wells as a Master's thesis at the University of Connecticut in 1973.

These studies serve as background for further scientific study of the lake. It is hoped that this social study, which has no historical counterpart, will aid the future history of Columbia and its lake.

III. Contemporary Situation

A. Land Use

Located just 26 miles and about 30 minutes east of the Hartford area, Columbia and the surrounding towns of central Connecticut (Ashford, Chaplin, Coventry, Hampton, Lebanon, Mansfield, Scotland, Willington, and Windham), have experienced the growing pains of out-migration from the Hartford area.

Columbia is primarily residential-agricultural land. Except for a small commercial portion on the Hop River, Columbia is zoned RA-1 or RA-2, requiring 60,000 and 40,000 square feet, respectively, as minimum lot size. RA-1 is a small portion of the town on the eastern border of the town and lies outside the lake watershed. RA-2 permits single-family, detached residences, agricultural operations with certain restrictions, churches, libraries, schools and the like. RA-2 zoning requires a minimum lot frontage of 150 feet and a minimum floor area of housing of 1,000 square feet. (PZC Regulations, 1974.)

Such stringent regulations have not always been in effect, however Zoning Commission minutes of the 1940's suggest a trend toward decreasing stipulated lot size and living area of homes. As a result many lots and homes around the lake surveyed and built during the 1940's are quite small and often situated very close to the edge of the lake. They remain due to a "grandfather clause" which stipulates that all non-conforming structures, uses and/or lots established prior to PZC regulations may continue. If, however, more intense use is desired, the newer regulations are in effect.

This is particularly important if lake residents attempt to convert

Table 1 - Number of Lots by Distance from Lakeshore*

Survey Map #	Number of Lots Entirely Within:		
	300 feet	300-600 feet	600-1,000 feet
9	5	1	
19	15	11	
20	36	8	17
21			29
22	39	18	3
23			7
24	38	25	16
25	47	33	4
Total N = 352	180	96	76
Percent of Total	51%	27%	22%

*Source: Property Maps, Town of Columbia
(James Sewall Co., Old Town, Maine, 1967)

seasonal homes to year-round dwellings. "Seasonal occupancy" is defined as residence for eight months of the year, although most lake property owners do not stay that long. Restrictions on length of occupancy are based, formally, on both lot size and septic tank capacity and, informally, on building code regulations such as insulation or heating. Thus, if one were to convert a seasonal home to year-round use, zoned "use" of the property would intensify, and the owner would have to conform to new regulations.

Most lake lots do not meet the present 40,000 square foot minimum of zoned RA-2 dwelling lots. Of those that do, the septic systems may pass percolation tests administered by the health officer; but the tanks often do not have the capacity for year-round use, nor do the septic systems necessarily have correct drainage and/or distance from homes, wells and/or surface water. (Specifications of tank capacity are determined by the number of "bedrooms", often manipulated by residents to increase liveable floor area to satisfy zoning requirements. A minimum liquid capacity of 1,000 gallons is required to serve a house with three bedrooms or less. A 250 gallon increase is required for each additional bedroom.) Moreover, most lake lots slope toward the lake so that while, technically, only 25 feet are needed between a sewage disposal system and a body of water, actual drainage considerations necessitate more footage than legally stipulated. However, many lake lots simply do not have the area available to meet all the requirements for conversion. (Public Health Statutes, State of Connecticut, 1973.)

Lot frontage on the lake is also an important consideration for a lake property owner contemplating conversion of a seasonal home. The amount of frontage is directly related to the extent of filtration of fertilizer and septic tank effluents before they reach the lake (Columbia has no public sewer

system). Table 1 shows the approximate number of lots by distance from the lake. While the survey maps from which these data were obtained do not specify the distance of the house and/or the septic leaching field from the lake, it can readily be seen that there is almost a 100% increase in the number of lots between the 300 foot and 600 foot divisions in the Table. Thus, it is safe to assume that many lots, with dwellings and, therefore, with septic tanks, are close to the water's edge. Again, this decreases a seasonal resident's chances of converting to year-round occupancy.

It appears, however, that the number of year-round homes is increasing in Columbia. Building construction rose during the 1960's, but only 1 of the 181 dwellings built between 1966 and 1974 was specifically designated as a "summer home" with occupancy limited to eight months. Although new home construction has declined in the 1970's, most of the building permits issued have been to "remodel" , "add on to", or "increase living space of", perhaps to meet the current living area requirements for conversion to year-round dwellings. Formal regulations notwithstanding, the trend toward year-round residency will tax existing septic tank capacity, especially during the spring when natural run-off is greatest. This is particularly true for septic systems situated close to the lake.

Ownership of residential lots around the lake is divided almost equally between residents and non-residents, a resident being considered by the tax assessor as a person living year-round in the Town of Columbia (Table 2). Few cottages around the lake are rented. Of the approximately 294 lots considered to be in the lake area (defined in this report as those within

1,000 feet of the shoreline), almost one-third of them are undeveloped. These lots are usually rights-of-way and/or lots with inadequate frontage or area to permit dwellings under current regulations.

The zoning regulations, especially with respect to conversion, are a source of controversy within the community. Many of the non-resident owners bought lake homes and/or lots with the idea of eventually living there year-round. Under existing PZC regulations they often can only use their property seasonally, if at all. This is one policy area separating resident from non-resident. The resident is receptive to new, stricter, zoning and building regulations because his home and/or lot is already being used year-round; even if the use is non-conforming, year-round use may be continued under the "grandfather clause".

Ownership of buildings used for commercial purposes is also equally divided between non-residents and residents. Since commercial enterprises do not fall within the watershed area, regulation of existing commercial activity is of little consequence for the lake. (However, a review of PZC records suggests that the citizens of the town wish to limit commercial development.)

Subdivisions, too, are regulated closely by the Planning and Zoning Commission. Survey maps of a subdivision under consideration, reports of proposed uses, and even soil studies for the larger tracts of land must be presented to the PZC. A public hearing is then called with specific invitations issued to adjoining property owners to attend and discuss the proposal (PZC Subdivision Regulations, Sec. 3 - Final Subdivision Plan: (d), 1967).

Table 2 - Ownership of Lots Around the Lake,

by Residential Status

	N		%		Total	
	Resid.	Non-Res.	Resid.	Non-Res.	N	%
Dwelling lots	104	106	35.4	36.0	210	71.4
Owner occupied	94	95	32.0	32.3	189	64.3
Rented out	10	11	3.4	3.7	21	7.1
Undevelopable lots	42	32	14.3	10.9	74	25.2
Lots to be sold (Lake View Park)	-	-	-	-	6	2.0
Tax exempt lots	-	-	-	-	4	1.4
Total	146	138	49.7	46.9	294	100.0

Apparently public opinion is taken seriously, for the PZC has rarely ruled against a clear expression of public preferences. The only subdivision under discussion at present is a LARM Associates proposal for 81 lots on 92 acres situated outside the watershed area. The first eight lots along the highway are considered good building land, but the remainder may prove to be too swampy for future development under PZC regulations.

The "swampiness" of the land in Columbia has been, and probably will continue to be, a deterrent to future development. Draining the land to meet PZC regulations and the State building code is expensive. Mono Pond Development has questioned the PZC repeatedly since 1962 about the feasibility of developing the Mono Pond area southeast of Columbia Lake. Compliance with the stringent zoning regulations concerning drainage and fill appears to be too expensive for the developers, for they have not approached the PZC since July 1973.

Drainage, however, is not the only problem encountered by developers who wish to build in Columbia. Land, including submerged land, which consists of any soil types designated as poorly drained, very poorly drained, alluvial and/or flood plain by the National Cooperative Soil Survey of the U.S. Soil Conservation Service is classified by the State of Connecticut as Inland-Wetland. It falls under the jurisdiction of the Department of Environmental Protection (DEP). The land does not necessarily have to be "wet", and all "swampy" land is not a "wetland". It is, rather, classified by soil categories. In Columbia approximately 15% of the land is classified as wetland, though not even DEP knows the exact percentage of wetlands in Columbia.

Grazing, residential homes and boat mooring are unrestricted uses granted on wetland by the State. However, for "maintenance of residential property" on wetland, the "largest minimum residential lot site permitted in the municipality" must be used (Public Act 155, Sec. 22a-39-3.1d). In Columbia this is RA-1, or 1 1/2 acre, zoning. Thus, wetland remains wetland, as classified by soil type, even if drained for building; but in Columbia it must be rezoned as RA-1 in order to be suitable for residential use. The rezoning of land in Columbia is not taken lightly by its citizens. In light of the concern many feel for the ecology of the town, and the expressed desire to protect the residential nature of the town, the PZC appears unlikely to rezone land for building purposes.

Despite strict zoning and significant amounts of wetlands, 33% (4,599 acres) of Columbia's open land is suitable for some type of urban use (Table 3). Thus, Columbia, the second smallest town in the Windham Planning Region with 13,952 acres of land, may face future urbanization pressures if out-migration from the Hartford area continues.

Table 3 - Land Area in Columbia Classified by Designated Use:* (Percent)

Use Designation	% of Total Land
Open land suitable for urbanization	21.4%
Open land suitable for limited urbanization	11.6%
Open land unsuitable for urbanization	21.3%
Pre-subdivided into less than 5 acres	12.2%
Streambelt	25.9%
Lakes and Ponds	2.9%
Public land	1.4%
Roads	3.3%
Total	100.0%

*Source: A Conservation Plan for Columbia
Columbia Conservation Commission, 1973.

B. Population

Columbia, then, is largely a residential "bedroom community", its citizens working outside town boundaries. Yet Columbia faces the possibility of increased population pressures, particularly if the interstate highway, I-84, is completed, thereby linking Hartford to nearby rural communities. Surrounding towns have experienced a relatively high rate of population growth and, while Columbia's average population growth almost stopped between 1970-1972, many surrounding towns continued to grow (Table 4). Hence, continued residential out-migration from the business districts and increased development of surrounding towns may put added pressure on Columbia to develop and relieve some of the residential overflow.

The 1970 Census data reveal some important facts about the current population in Columbia, and suggest some hypotheses concerning public attitudes toward the lake, the town, and future development (Table 5). A small town by U.S. Census definitions, Columbia has only 3,129 persons. The population is almost entirely Caucasian, moderately well-educated, and employed largely in professional and technical capacities. With an average annual family income of between $12,000 and $25,000, the population is well-to-do. Most people work outside the town, and their leisure time is spent in Columbia. Accustomed to responsibility in their occupations, many people have become concerned with the problems of the area, and take active part in the government and citizen action groups. Their occupations and income levels facilitate such activities. Having monitored the experience of unregulated development in surrounding towns, Columbians seem suspicious of increased growth and development.

Table 4 - Current Population Estimates and Growth Rates:

Windham Region, 1970-1972**

Town	Conn. State Health Dept. Est.'70-'72	WRPA Est. Based on Housing Unit Count'70-'72	Avg. Annual Growth, '70-'72, WRPA Est.	Avg. Annual Growth '60-'70	Avg. Annual Growth Rate '70-'72, WRPA Est.
Ashford	2,300	2,500	172	6.4%	8.0%
Chaplin	1,700	1,800	88	3.2%	5.4%
Columbia	3,200	3,200	37	4.5%	1.2%
Coventry	8,500	8,600	192	2.8%	2.4%
Hampton	1,100	1,200	20	2.1%	1.8%
Lebanon	4,100	4,000	79	5.6%	2.1%
Mansfield*	18,400	19,400	448	3.7%	4.1%
Scotland	1,000	1,000	10	4.9%	1.0%
Willington	3,900	4,200	193	8.7%	5.1%
Windham	20,600	22,000	972	1.6%	5.0%

*Excluding Mansfield Training School

** Source: State of the Region, 1973, Windham Regional Planning Agency, February 1973.

Table 5 - 1970 Census Data for the Town of Columbia*

A. Employed Persons 14 Years Old and Over

by Occupation and Sex

Occupation	Male	Female	Total	%
Professional, Tech.	189	108	297	22.2
Managers, Adm. (not farm)	78	23	101	7.6
Sales Workers	45	14	59	4.4
Clerical and Kindred	35	165	200	15.0
Craftsmen, Foremen	203	8	211	15.8
Operatives (not transport.)	112	59	171	12.8
Transport. Equip. Operators	55	4	59	4.4
Laborers (not farm)	30	-	30	2.2
Farmers, Farm Managers	11	-	11	0.8
Farm Labor, Foremen	17	-	17	1.3
Service (not private hsehold)	54	63	117	8.8
Private Household Workers	-	6	6	0.4
Occupation not reported	47	9	56	4.2
Total	876	459	1335	100.0

B. Family Incomes

Income (annual $)	Number	Percent of Total
Less than 1,000	8	.95
1,000-1,999	8	.95
2,000-2,999	4	.47
3,000-3,999	18	2.15
4,000-4,999	16	1.91
5,000-5,999	13	1.55
6,000-6,999	33	3.95
7,000-7,999	37	4.43
8,000-8,999	58	6.94
9,000-9,999	96	11.49
10,000-11,999	123	14.73
12,000-14,999	127	15.20
15,000-24,999	265	31.73
25,000-49,999	29	3.47
50,000 and more	0	0.00
Total	835	100.00

Table 5 (Cont'd.)

C. Persons 25 Years Old and Over by Years of School Completed

Years of School Completed	Male	Female	Total
0 (nursery, kindergarten)	6	13	
Elementary			
1-4	13	11	
5-6	22	30	
7	17	24	
8	90	109	
			335
High School			
1-3	175	101	
4	270	382	
			928
College			
1-3	120	84	
4	38	26	
5 or more	82	77	
			427
Total	833	857	1,690

D. Persons by Race and Sex

	White	Negro	Indian	Philippino	Other	Total
Male	1554	4	-	1	-	1559
Female	1564	4	1	-	1	1570

*1970 Census Data, U. of Conn. Social Science Data Center.

IV. Lake

A. Technical Information

Columbia Lake is 1.5 miles northwest of the center of Columbia. It is easily accessible by automobile via Route 87, Lake Road, Erdoni Road, and Sunny Slopes which join to circle the water's edge, a shoreline of approximately 12.2 kilometers. With the exception of the public beach, however, the property adjoining the lake is privately owned. The lake has a maximum depth of 7.8 meters and covers 114 hectares (E.A. Wells, 1973). The lake's watershed (4.59 square kilometers) is entirely within town boundaries.

B. Use and Access

Today, residents of Columbia and non-resident property owners use the lake purely for recreational purposes: motor boating, sailing, water skiing, fishing, and swimming. Property owners around the lake, and those with rights-of-way, have complete access to the water. They can do what they want, when they want, wherever they want, within Town ordinances. The rest of the population has access to the lake via the public dock and beach.

In the past, the beach was open to anyone, but at a special town meeting in 1950, its use was limited to Columbia residents only. Now the Town Recreation Council sells beach "memberships" to non-lakefront property owners, and the money goes toward the upkeep of the beach and dock area. Regulations restricting use of the boat ramp during certain hours, mooring of boats, and use of the beach area are all under the jurisdiction of the Recreation Council.

Despite access to the lake, however, many residents who do not own lake property feel quite limited in their ability to use the lake. An indicator

of this is the number of applications for permits to build swimming pools; 26 were approved between 1966 and 1974 with the majority being approved in the 1970's. Even with no comparative data, this seems quite high for a small town with a lake. This might be a reflection of the residents' feelings toward the question of access. Other aspects which point toward a conflict of access and use are disagreements concerning PZC lot size increases (and thus regulations on conversion of homes in the lake area) and the mooring of boats.

The Columbia Lake Association (CLA) has petitioned the Town Selectmen to regulate boat mooring privileges on the lake. The CLA claims that there are boats on the lake whose owners are not qualified town residents. However, the lake patrol has found no evidence of this. The CLA also wants mooring restricted. If boats are moored off right-of-way property, they restrict swimming and fishing for lakeshore property owners. If they are moored further out, water skiing is restricted. According to Town statistics, however, the number of boats registered in Columbia is not increasing. Indeed, the number seems to be decreasing slightly. Thus, it seems the CLA is trying to protect its members' interests by restricting the privileges of others to moor boats.

Townspeople owning rights-of-way object to such CLA action since they, too, own land adjoining the water and feel that they are entitled to the same rights as dwelling lot owners. Townspeople restricted to town dock use object loudly to further limiting their access and thus use of the lake. The Selectmen have said only that the mooring question requires more study

and thought. The conflict of access and use remains, but it is doubtful that the Selectmen will establish a mooring ordinance at this time.

In addition to the mooring question, the Town has assumed the responsibility for the speed of motorboats. Currently the permissible horsepower is being reduced. Effective April 1, 1973 "no person shall operate on the waters of Columbia Lake, a boat with an outboard engine whose horsepower exceeds 135 or a boat with an inboard engine whose horsepower exceeds 225". After July 1, 1975 these limits will be reduced to 80 and 150 respectively (Ordinance Providing for Safety Regulations of Motor Boats, Water Skiing and Other Water Activities on Columbia Lake", adopted March 7, 1964). This regulation affects use of the lake with respect to water skiing, but it is not now a contentious issue.

C. Problems

The people around the lake, of course, view the water area as an asset, especially in terms of property values. While townspeople may protest limited access, and some not even take advantage of the lake, the large majority seems concerned with the lake's upkeep.

The annual problem of repairing the dam has at last reached a point where it can no longer be ignored. Although the water level of the lake is lowered about two meters each fall to protect docks from ice damage and to allow property owners to make repairs on their property, the damaged gate in the dam continues to leak throughout the year. The State of Connecticut Department of Environmental Protection, Water and Related Resources, has jurisdiction over those dams "...which by breaking away or otherwise might

endanger life or property" (Connecticut General Statutes, Sec. 25-110). DEP is responsible for dam inspection and final approval. Since the Town owns the dam, it is responsible for its maintenance. Having failed a state inspection in 1964, the Town was ordered to remedy the situation. Correspondence from the CLA expressing a desire that something be done helped persuade the Selectmen to alleviate the situation.

But, temporary measures (e.g., sandbagging) have proved ineffective. Relocation of Route 87 to straighten a curve south of the dam where a fatality occurred might have solved the problem. First proposed by the State Highway Department in 1968, the relocation would have raised the spillway and filled in a portion of the downstream embankment, strengthening the dam structure as well as increasing highway visibility. This plan has been halted, however, and the Town is once again being pressured by the state and citizen groups to do something.

Four proposals - (1) temporarily draining the lake, (2) building a cofferdam, (3) building an earthdike, and (4) repairing it underwater - were presented as permanent solutions (Ahern, 1972). Draining the lake was vetoed in a 1971 meeting betwen the CLA and the Board of Selectmen. The CLA feared loss of property values on the assumption that the lake would not refill and/or that fish and wildlife would not return. However, the lake seems to have an adequate water turnover; moreover, the DEP says that loss of fish and wildlife would be negligible, even beneficial for restocking purposes. Temporarily draining the lake seems to be the most practical solution with respect to finances despite the temporary inconvenience. To date, nothing has been decided.

Lake cleanliness is of increasing concern to town residents. The water appears to be fairly clean and has "passed" the Continental Testing Lab's examinations. During summer mornings, however, residents have observed a surface film which is dissipated by motor boat activity later in the day. An increase in algae growth in the fall has also focused residential attention on the lake.

With respect to water quality and the aforementioned issue of dam repair, it is possible that the leaking dam contributes positively to water quality. On the basis of E.A. Wells' study of the distribution of total phosphorus in Columbia Lake, it appears that phosphorus is concentrated in the lower levels of the lake. Since the dam is near the deepest point of the lake, the subsurface leak could be removing significant amounts of phosphorus, thereby enhancing the appearance of water quality. Any proposal for dam repair has the potential of increasing phosphorus concentrations and, as a consequence, decreasing water quality.

V. Who makes decisions about the lake?

Throughout this report, mention has been made of several groups involved in decision-making regarding the lake. An awareness of the workings and influence of these groups is important since no single group has total control. Group interactions are, then, an important factor to consider if future decisions regarding the lake are to be based upon scientific information. As noted earlier, the use of scientific information is contingent upon social awareness.

A. Federal and State Governments

As far as is known, the federal government has no direct influence on Columbia Lake. The lake is Town-owned and thus does not fall under federal jurisdiction. It does, however, fall under state regulations in three major areas: public health restrictions with respect to septic tanks, DEP dam inspection, and the Inland-Wetlands and Open Space restrictions (Public Acts 155 and 490 of the State of Connecticut, respectively).

State jursidiction concerning septic systems and the dam have been discussed previously. Septic tank regulations are enforced by the PZC and the Town's building and sanitation inspector. With respect to dam repair DEP appears to be quite patient in its charge to Columbia. Real pressure in this regard, then, emanates from local groups.

In terms of wetlands and open space, the state wields a heavier hand. Columbia attempted in 1973 to establish its own Wetlands Commission for the purpose of preparing town wetland regulations. Given until January

1974 to accomplish this and failing, the Town is subject to state jurisdiction. Since the PZC appears to have strict enough regulations, compliance with state regulations is not problematic. Faced with greater urbanization pressures, these regulations may be challenged.

B. Windham Regional Planning Agency

The Windham Regional Planning Agency serves in an advisory capacity to the Town. Established in 1966 under Chapter 127 of the Connecticut General Statutes, the WRPA consists of ten towns in the region which allocate a small portion of their budgets to the Agency for the purpose of conducting regional studies. "In its plans, the Agency may recommend what it feels to be desirable actions, but it has no authority to make its plans become realities" (Organizational Development for the WRPA, Hultgren and Tenzer, 1971). The WRPA does, however, have a "soft veto" with respect to its review of applications for federal and state grants, the A-95 review process. The money usually goes to communities which "cooperate" with agency guidelines.

Columbia has never experienced a serious problem with WRPA in this regard. As one of the smaller communities involved, the Town only uses the Agency for the studies it provides. Columbia's own regulations are well within WRPA guidelines.

C. The Town

Ultimately, the Town has final jurisdiction over the lake. At present, it allocates less than 1% of its annual budget for the lake and dam. The beach area is administered by the Recreation Commission. Governmentally, the Town has the last say, but differing public opinions may inhibit it from taking any decisive action, even if such action may seem warranted (i.e., the dam).

D. Planning and Zoning Commission

Established in 1941 under the aegis of the Town, the Zoning Commission of Columbia issued its first regulations at the request of the CLA which became concerned with growth and its effects on property values. Reducing minimum house and lot sizes were the major ZC decisions during that period. In the 1950's, however, this trend began to be reversed as elected ZC members realized the consequences of unregulated development in surrounding towns. In 1953 planning was added to the Commission's functions, and the name changed to PZC. Minimum required lot sizes were increased, except around the lake area which was already "fairly heavily developed".

In 1964 and 1965 the PZC took part in the Federal Government's 701 Master Plan under which towns hired professional planners with federal money to project future growth and development. Under Samuel Spielvogel, maps and projections for Columbia were made, but few of these plans have reached fruition. In 1973 the PZC attempted their first planned rezoning in an area adjoining Route 6. The area was to be modified to residential-commercial

to prevent the Town from becoming simply a bedroom community. The plan was forcefully denounced by the public during a town meeting, and thus, the first attempt to implement a portion of the Master Plan failed. Changes from the residential nature of the town are not looked upon with favor by town residents (Hartford Courant, 5-13-73, 6-1-73).

Concern with septic tank regulation came to the fore during the '60's, specifically the possible pollution of Columbia Lake as cottages were transformed from seasonal to year-round residences with no increase in septic disposals (PZC minutes, 9-12-67). Recently the PZC has discussed even more stringent regulations on such residential conversions, e.g., increasing minimum lot size. These proposed regulations will affect the lake area more as the trend toward year-round housing increases. The CLA is opposed to such PZC regulations because its membership wants to increase property values through home improvements. Certification from the health official who performs percolation tests should be enough, they feel. This is a contradiction because, by so attempting to raise their property values, the CLA may be jeopardizing them through greater potential pollution of the lake.

As mentioned before, the PZC regulations concerning zoning and building are rigidly enforced, and PZC efforts to "open up" Columbia to non-residential ventures have failed. The citizens do not want to change the residential nature of the town. In the final analysis, the public has the say on PZC decisions, for the PZC Executive Council has never reversed majority opinion voiced during a public hearing.

E. The Columbia Lake Association

Yet publics have competing interests. The Columbia Lake Association (CLA) was established in 1941 with its first constitution and bylaws being approved in 1945. A member is "any person, firm or corporation, except the body politic of the Town of Columbia, who own real estate bordering on the waters of Columbia Lake..." (CLA Constitution, Sec. I). The CLA encourages regulations concerning the lake which would enhance the members' property values. The fact that the Association is a closed organization trying to influence decisions made concerning a town-owned lake has not endeared the CLA to the townspeople.

The primary problems of access and use, the dam, and lot size and conversion of summer homes around the lake have already been discussed. The CLA members feel that, because they pay more taxes, they should have more say in these lake-related decisions. All property owners in the town pay a 40-mil rate; lake property, of course, is assessed at a higher value than other town property. The Association wants to preserve a higher assessment but, at the same time, feels that this entitles its members to greater influence in decision-making. In 1972 property in the entire town was reassessed upward, and in January of 1973 the CLA formally objected. The Association wanted to bring suit against the Town for assessing the property "improperly" but was advised against it insofar as the CLA owns no property and thus is not a single, "aggrieved party".

CLA concern with property values and tax assessment may be attributed to the percentage of Association members classified as non-residents of

Columbia. Of the approximately 182 potential CLA members (measured by the number of lots adjoining the water), nearly 70% (124) are actual CLA members. Half of the members are non-residents of Columbia. CLA officers (president, secretary and treasurer, who collects the nominal $2 annual dues) are non-residents. The active members of the CLA, about 10-20, appear to be non-residents as well, since CLA activity seems to stop during the winter months.

The antagonism between the Association and the rest of the town may be based upon the non-residential influence in the CLA, the access/usage question, and/or the conflicting purposes of various groups such as the Conservation Commission. In any case, the antagonism is present, not necessarily in the written word, but definitely in people's minds.

F. Conservation Commission

The Conservation Commission (CC) was established at a town meeting in 1971. Its members are town residents, volunteer-appointees by the selectmen, and serve as an unofficial liaison between various state departments and the Town.

It might be assumed that the CLA's underlying purpose of wanting to protect the lake in order to preserve property values would be consistent with the functions of the CC. This is not the case, however, particularly with respect to housing improvements (e.g., conversions and additions) in the lake area. The CC is in favor of proposed increases in regulation while the CLA feels they are unnecessary. This may be the point at which ecology and economics conflict.

Conflict is also apparent in the organizational relationship between the CC and the PZC. An official liaison group between the two commissions was attempted, but cooperation finally broke down over the question of which organization would have the final authority for decisions. The CC's official role is advisory, although for large subdivision applications the PZC turns the maps over to the CC for review and comment about soils, drainage and watershed/streambelt interference. The CC's advice is taken seriously by the PZC. Other than these contacts, there are no formal linkages between the two organizations.

It is possible, however, that while there is some antagonism between the two groups insofar as the CC urges stricter zoning and the PZC attempts to "open up" Columbia, the PZC has benefited from CC involvement. The two organizations share the same map storage room; in addition, studies made at the CC's request are available to PZC personnel (e.g., the 1972 U.S.D.A. streambelt study, and the soil survey of the town).

The CC has served as a definite information center for the town residents, too. Pamphlets, lectures, question-and-answer sessions, and the formation of a Conservation Plan for Columbia have served to sensitize citizens to conservation issues, particularly with respect to the lake area.

VI. Conclusions

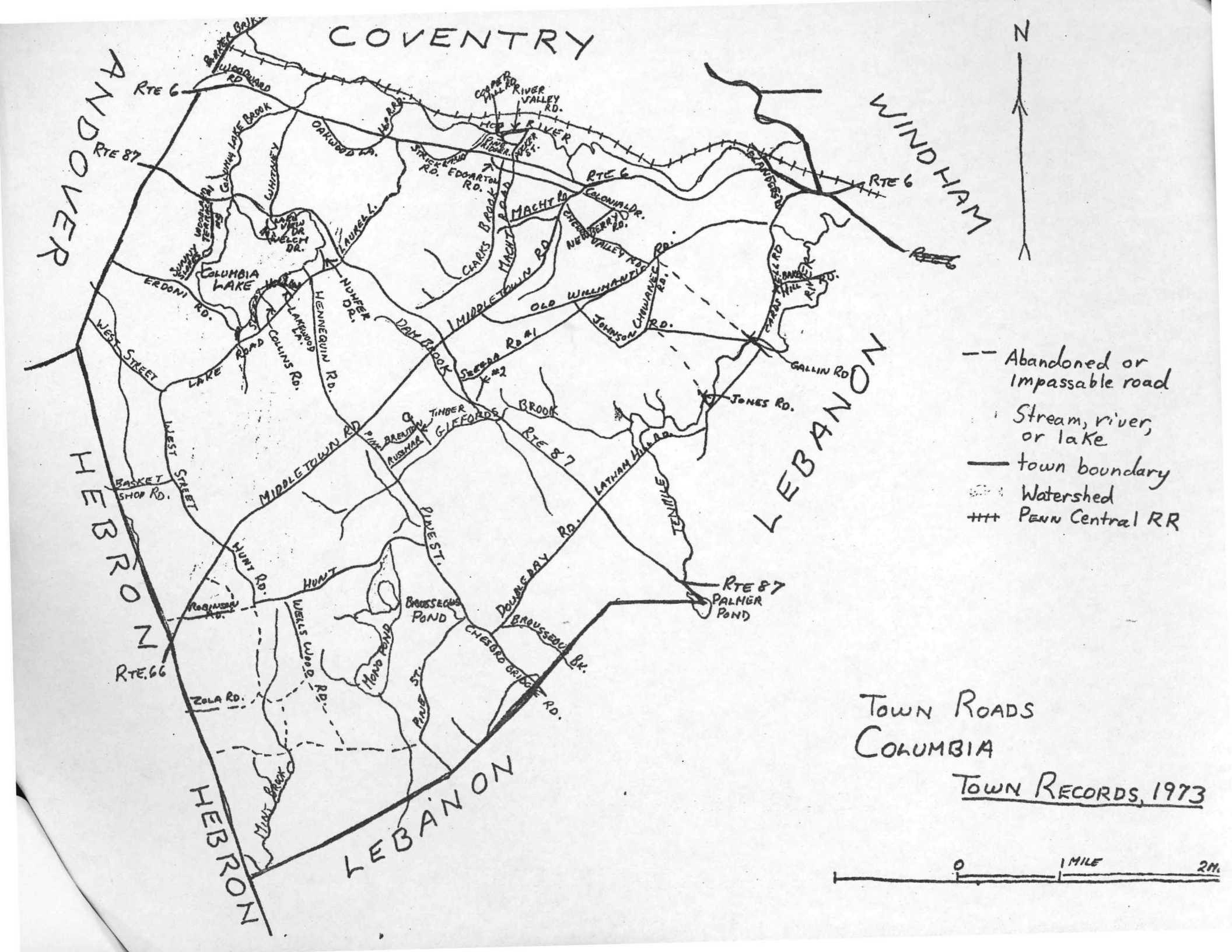
The basic premise upon which this report was based is that the future of the lake will be determined by social rather than scientific factors. That is, while scientific information may be generated and disseminated without public involvement, public action depends upon the extent of consensus among various decision-making bodies as to the existence of a problem and alternative solutions to it. Scientific information becomes relevant only under conditions of at least a moderate consensus. Various groups can, of course, seek to gain power via the acquisition of scientific information, but effective public action is possible only after some consensus has been forged.

Columbia was selected as the site for this pilot study because the population is small, and, demographically, relatively homogeneous. In addition Columbia is primarily residential. The lake is small and is located entirely within town boundaries. Moreover, the lake watershed lies within town boundaries. Finally, the town has, in the past, demonstrated its concern for lake problems. These factors suggest that decision-making regarding Columbia Lake is apt to be a less complicated process than might be anticipated under conditions of greater size and/or heterogeneity. By and large, this proposition has not been refuted by our study.

Nevertheless, there appears to be enough differentiation among decision-makers with respect to Columbia Lake such that the lake's future cannot be taken for granted. At the present time, the major "actors" are the CLA and the Town (selectmen, CC, PZC, and the public-at-large). The principal issues are access and use, zoning, and dam repair. These issues are potentially

resolvable at the local level. In the future, however, if the decisions are not resolved, the decision-making arena may be broadened to include regional and statewide units such as DOT (road construction), DEP (dam repair and wetlands legislation), Public Health (lake use), and WRPA (future growth and development).

The context in which scientific information, now being gathered, may become relevant is, then, well-bounded but nevertheless dynamic. Thus, while the decision-making context with respect to Columbia Lake is relatively simple, we cannot guarantee that the future of the lake is assured. This suggests that the future of other lakes, situated in more complicated decision environments, is fraught with uncertainty. The implication of this conclusion is that the future of lakes in complicated decision environments depends, first, on the identification and awareness of the decision- making network and, second, upon the acquisition of scientific information.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MACHT ROAD
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